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SELECTED BIBLIOGRAPHY OF PUBLICATIONS RELATING TO UNDESIRABLE EFFECTS UPON AQUATIC LIFE BY ALGICIDES, INSECTICIDES, AND WEEDICIDES

William Marcus Ingram, et al

Public Health Service
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Selected Bibliography of Publications

Relating to Undesirable Effects Upon Aquatic Life

by { ALGICIDES
INSECTICIDES
WEEDICIDES

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE — Public Health Service

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SELECTED BIBLIOGRAPHY OF PUBLICATIONS RELATING TO UNDESIRABLE EFFECTS UPON AQUATIC LIFE

BY

ALGICIDES
INSECTICIDES
WEEDICIDES

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I

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II

INDEX

		Page
I.	INTRODUCTION	1
II.	REFERENCES ON UNDESIRABLE EFFECTS OF ALGICIDES	3
III.	REFERENCES ON UNDESIRABLE EFFECTS OF INSECTICIDES	7
IV.	REFERENCES ON UNDESIRABLE EFFECTS OF WEEDICIDES	21
V.	REFERENCES ON TOXICITY BIOASSAY METHODS RELATING TO FISH	26
VI.	REFERENCES ON TOXICITY BIOASSAY METHODS RELATING TO INVERTEBRATES	27
VII.	ALPHABETICAL LIST OF CHEMICALS REFERRED TO IN BIBLIOGRAPHY	27

INTRODUCTION

The papers which are included in this bibliography contain data on the harmful effects of algicides, insecticides, and weedicides on aquatic organisms other than those which they were designed to control. A bibliography published in 1953[1] by the U.S. Public Health Service, lists pertinent articles on the effectiveness of various chemicals for the control of algae and the higher aquatic plants.

The use of insecticides, weedicides, and algicides has increased many fold during the past decade. Each year thousands of tons of these materials are used, and each year they are more widely used. Very often these materials are broadcast without much consideration of their overall toxic effects and without knowledge of their direct or indirect effects on aquatic life.

Algicides, insecticides and weedicides perform an important and essential function. It is the intent of this publication, not to discourage their use but rather to enable those who use these economic poisons to minimize or eliminate their damages to aquatic life by profiting from the experience of others as set forth in the papers cited.

It is especially pertinent at this time that such data as are now available on the toxicity of the newer insecticides, weedicides and algicides be called to the attention of those engaged in public health, water supply, water pollution, and various agricultural programs. It is hoped that this bibliography will meet the need by supplying a concise, annotated list of papers dealing with the toxicity to aquatic life of the various materials now being used.

Those working in water pollution control programs are confronted with a real problem through the widespread use for agricultural purposes of certain pesticides which are extremely toxic to fish. Heavy rains following the application of some of these materials have resulted in runoff water toxic to fish, and extensive kills have occurred in several areas.[2], [3], [4]

Another aspect of the problem is that in the use of algicides and weedicides, the destructive action may be delayed or indirect and thus might not be attributed to the control chemicals. The decay of algae and higher plants killed by control agents can initiate a cycle of events that may lead, under certain conditions, to the lowering of dissolved oxygen to critical levels which may result in the death of fish and fish food organisms. The bacterial decomposition of algae and aquatic weeds uses up the dissolved oxygen in the water and under such a condition a fish kill may result.

In selecting references for inclusion in this bibliography preference was given to the ones that are readily available to those working in water pollution and water treatment. Because copper sulfate, sodium arsenite, DDT, and 2,4-D have been available for a longer

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1. ANON. 1953. Handbook of Selected Biological References on Water Pollution Control, Sewage Treatment, Water Treatment. U. S. Department of Health, Education, and Welfare, Public Health Service Publication No. 214. pp. 1-66.
2. ANON. 1948-49. Toxicity of Insecticides to Fish. Death caused by Cotton Dusting. Report for Fiscal Year 1948-49. Dept. of Conservation, State of Alabama. pp. 35-36.
3. YOUNG, L. A., and H. P. NICHOLSON. 1951. Stream Pollution Resulting from the Use of Organic Insecticides. Progressive Fish-Culturist, Vol. 13, No. 4, pp. 193-198.
4. WARRICK, L. F. 1951. Blitz on Insects Creates Water Problems. Proc. 6th Industrial Wastes Conference, Purdue University. pp. 455-463.

period, the selected references dealing with these compounds are more numerous and may appear overly weighted when compared with but a few references on aldrin, toxaphene, lindane, and parathion. This should not be construed to mean that the latter chemicals are necessarily less destructive to aquatic life, but only that little as yet has been reported on their toxicities.

A scheme using master keys has been prepared for each of the main sections of this bibliography; namely, Algicides, Insecticides, and Weedicides. These master keys list by number the control chemicals and all organisms referred to in the papers included in the bibliography. Thus, by the use of these keys one can quickly select all papers dealing with a specific control chemical or all those giving data on the effects of such chemicals on certain organisms.

For investigators who may be called upon to bioassay algicides, insecticides, and weedicides, a section on bioassay references is included.

REFERENCES ON UNDESIRABLE EFFECTS OF ALGICIDES

MASTER KEY TO REFERENCED ALGICIDES

Organic Algicides

1. 2, 3- dichloronapthoquinone
2. Dehydroabietylamine acetate
3. RADA (Rosin amine D acetate)

Inorganic Algicides

4. Chlorine
5. Copper paints
6. Copper silicate
7. Copper sulfate

MASTER KEY TO REFERENCED ORGANISMS DESTRUCTIVELY AFFECTED BY ALGICIDES

1. Aquatic plants (flowering-weeds)
2. Crustacea
3. Fish
4. Insects
5. Invertebrates (unnamed)
6. Mollusks
7. Worms
8. Zooplankton
9. Miscellaneous organisms (terminology of references):
   a. Fish food organisms
   b. Bottom organisms

1. Anon.
   1942. Copper Sulphate for Aquatic Nuisances.
   Public Works, vol. 73, no. 9, pp. 21, 47.
   Referenced chemicals: 7
   Referenced organisms: 3

2. Anon.
   1950. Water Quality and Treatment.
   American Water Works Assoc., pp. 1-451.
   Referenced chemicals: 4, 7
   Referenced organisms: 1, 3, 4, 7

3. Anon.
   1952-53. Fisheries Research--Weed Control Experiments.
   State of Alabama, Dept. of Conservation
   Rept. for fiscal year 1952-53, pp. 115-116.
   Referenced chemicals: 3
   Referenced organisms: 3

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1954. Chemical Controls in Relation to Wildlife.
Presented before Pesticide Chemicals School, Clemson Agricultural College, Clemson, S. C., Feb. 9, 1954, pp. 1-11 (Mimeographed by U. S. Fish and Wildlife Service).
Referenced chemicals: 7
Referenced organisms: 3

5. Cox, C. R.
1946. Laboratory Control of Water Purification.
Case-Shepperd-Mann Pub. Co., pp. 1-386.
Referenced chemicals: 7
Referenced organisms: 3

6. Cox, C. R.
1952. Water Supply Control.
Bureau of Environmental Sanitation.
Bulletin 22, N. Y. State Dept. of Health, pp. 1-229
Referenced chemicals: 7
Referenced organisms: 3

7. Fitzgerald, G. P., Gerloff, G. C., and F. Skoog.
1952. Studies on Chemicals with Selective Toxicity to Blue-green Algae.
Sewage and Ind. Wastes, vol. 24, no. 7, pp. 888-896.
Referenced chemicals: 1
Referenced organisms: 1, 3

8. Hale, F. E.
1946. Control of Algae.
Water and Sewage Works, vol. 93, no. 4, pp. R-173-R-174.
Referenced chemicals: 4, 7
Referenced organisms: 1, 3, 7

9. Hale, F. E.
1950. The Use of Copper Sulphate in Control of Microscopic Organisms.
Phelps Dodge Refining Co., N. Y., pp. 1-43.
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Referenced organisms: 1, 2, 3, 4, 8

10. Hasler, A. D.
1949. Antibiotic Aspects of Copper Treatment of Lakes.
Transactions Wisconsin Acad. of Sciences, Arts, and Letters, vol. 39, pp. 97-103.
Referenced chemicals: 7
Referenced organisms: 1, 2, 3, 5, 6

11. Herman, E. F. and W. Anderson
1947. Control of Algal Growths in Hatching Ponds and Raceways.
Progressive Fish Culturist, vol. 9, no. 4, pp. 211-212
Referenced chemicals: 5
Referenced organisms: 3

12. Lawrence, J. M.
1954. Control of a Branched Alga, Pithophora, in Farm Fishponds.
Progressive Fish Culturist, vol. 16, no. 2, pp. 83-86
Referenced chemicals: 2
Referenced organisms: 3

13. Mackenthun, K. M.
1952. Cleaner Lakes Can be a Reality.
Wisconsin Conservation Bulletin, vol. 17, no. 1, 4 pp.
Referenced chemicals: 7
Referenced organisms: 3, 8

14. Mackenthun, K. M. and H. L. Cooley
1952. The Biological Effect of Copper Sulphate Treatment on Lake Ecology.
Wisconsin Acad. of Sciences, Arts, and Letters, vol. 41, pp. 177-187.
Referenced chemicals: 7
Referenced organisms: 4, 5, 6, 7

15. Matheson, D. H.
1952. The Effects of Algae in Water Supplies.
International Water Supply Association, Second Congress, pp. 1-82.
Referenced chemicals: 6, 7
Referenced organisms: 2, 3, 8

16. McKee, J. E.
1952. Water Quality Criteria.
California State Water Pollution Control Board, pp. 1-512.
Referenced chemicals: 7
Referenced organisms: 3

17. Meehean, O. L.
1945. Farm Fish Ponds and Their Management.
U. S. Fish and Wildlife Service Fishery Leaflet no. 27, pp. 1-9.
Referenced chemicals: 7
Referenced organisms: 3

18. Moyle, J. B.
1949. The Use of Copper Sulphate for Algae Control and Its Biological Implications.
Limnological Aspects of Water Supply and Waste Disposal: American Assoc. Advancement Science, pp. 79-87.
Referenced chemicals: 7
Referenced organisms: 3, 5

19. Smith, G. M.
1924. Ecology of the Plankton Algae in the Palisades Interstate Park, Including the Relation of Control Methods to Fish Culture.
Roosevelt Wildlife Bulletin, vol. 2, no. 2, pp. 95-195.
Referenced chemicals: 7
Referenced organisms: 3

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1936. Plankton Control in Morris Reservoir.
Journ. Amer. Water Works Assoc., vol. 28, no. 4, pp. 447-457.
Referenced chemicals: 7
Referenced organisms: 3

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1943. Weed Control in Hard-water Ponds with Copper Sulfhate and Sodium Arsenate [Sic-Arsenite].
Eighth North American Wildlife Conference, pp. 132-141.
Referenced chemicals: 7
Referenced organisms: 3

22. Surber, E. W.
1948. Chemical Control Agents and Their Effects on Fish.
Progressive Fish Culturist, vol. 10, no. 3, pp. 125-131.
Referenced chemicals: 7
Referenced organisms: 2, 3

23. Taft, C. E.
1945. The Algologist and Water Sanitation.
Ohio Journal of Science, vol. XLV, no. 3, pp. 97-102.
Referenced chemicals: 7
Referenced organisms: 3

24. Warrick, L. F., Wirth, H. E. and W. Van Horn
1943. Control of Micro-organisms and Aquatic Vegetation.
Water Works and Sewage, vol. 90, no. 7, pp. 267-272.
Referenced chemicals: 7
Referenced organisms: 2, 3, 4

25. Whipple, G. C., Fair, G. M. and M. C. Whipple
1948. The Microscopy of Drinking Water.
John Wiley and Sons, pp. 1-586.
Referenced chemicals: 7
Referenced organisms: 3

REFERENCES ON UNDESIRABLE EFFECTS OF INSECTICIDES

MASTER KEY TO REFERENCED INSECTICIDES

Chlorinated Hydrocarbon Insecticides

1. Aldrin (Octalene)
2. BHC
3. BHC-DDT mixture
4. Chlordane (Chlordan)
5. DDD (Rothane WP-50 and Rothane S-215;TDE)
6. DDT
7. DFDT
8. Dieldrin (Octalox)
9. Lindane* (Gammexane)
10. Methoxychlor
11. Toxaphene

Organic Phosphate Insecticides

12. Parathion
13. TEPP

Organic Insecticides of Botanical Origin

14. Pyrethrins
15. Rotenone

Copper Insecticides

16. Paris Green

MASTER KEY TO REFERENCED ORGANISMS DESTRUCTIVELY AFFECTED BY INSECTICIDES

1. Algae (attached)
2. Aquatic plants (flowering weeds)
3. Crustacea
4. Fish
5. Insects (other than nuisance forms)
6. Invertebrates (unnamed)
7. Molluscs
8. Phytoplankton
9. Worms
10. Zooplankton
11. Miscellaneous organisms (terminology of references):
    a. Fish food organisms
    b. Bottom organisms
    c. Plankton

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*Purified preparations of BHC which contain not less than 99% of the gamma isomer of BHC are now given the name Lindane.

1. Anon.
1947. Malaria Control on Impounded Water.
U. S. Public Health Service and Tennessee Valley Authority, pp. 1-422.
Referenced chemicals: 6
Referenced organisms: 1, 4, 5.

2. Anon.
1948-49. Toxicity of Insecticides to Fish. Death Caused by Cotton Dusting.
Rept. for Fiscal year 1948-49, Dept. of Conservation, State of Alabama, pp. 35-36
Referenced chemicals: 11
Referenced organisms: 4

3. Anon.
1948-49. Experiments on Toxicity of New Insecticides to Fish.
Rept. for Fiscal Year 1948-49, Dept. of Conservation, State of Alabama, pp. 36-37
Referenced chemicals: 2, 6, 11
Referenced organisms: 4

4. Adams, L., Hanavan, M. G., et al.
1949. The Effects on Fish, Birds, and Mammals of DDT used in the Control of Forest Insects in Idaho and Wyoming.
Journ. Wildlife Management, vol. 13, no. 3, pp. 245-254
Referenced chemicals: 6
Referenced organisms: 3, 4, 5, 9, 11

5. Anderson, B. G.
1946. The Toxicity of DDT to Daphnia.
Science, vol. 102, no. 2656, p. 539
Referenced chemicals: 6
Referenced organisms: 3, 10

6. Andrews, J. M. and S. W. Simmons
1948. Developments in the Use of the Newer Organic Insecticides of Public Health Importance.
American Journ. of Public Health, vol. 38, no. 5, pp. 613-631
Referenced chemicals: 4, 5, 6, 11
Referenced organisms: 3, 4, 8, 10

7. Arnason, A. P., Brown, A. W. A., Fredeen, F. J. H., et al.
1949. Experiments in the Control of Simulium Arcticum Malloch by Means of DDT in the Saskatchewan River.
Scientific Agriculture, Agricultural Institute of Canada, Ottawa, vol. 29, no. 11, pp. 527-537.
Referenced chemicals: 6
Referenced organisms: 3, 4, 5

8. Bishop, E. L.
1947. Effects of DDT Mosquito Larviciding on Wildlife. Part III. The Effects on the Plankton Population of Routine Larviciding with DDT.
Public Health Reports, vol. 62, no. 35, pp. 1263-1268
Referenced chemicals: 6
Referenced organisms: 8, 10

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1946. Present Position of DDT in the Control of Insects of Medicinal Importance.
American Journal of Public Health, vol. 36, no. 6, pp. 593-606.
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Referenced organisms: 3, 4, 5

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1946. Use of DDT in the Control of Insect Carriers of Disease with Special Reference to Water Supplies and Sewage.
Proceedings 19th Annual Conference, Md.-Del. Water and Sewage Assoc., (May 16-17, 1946) p. 23 (from Journ. American Water Works Assoc., vol. 40, no. 2, p. 264).
Referenced chemicals: 6
Referenced organisms: 4, 5

11. Bishopp, F. C.
1949. Precautions in the Use of Insecticides for Mosquito Control.
Mosquito News, vol, 9, no. 4, pp. 137-142
Referenced chemicals: 5, 6, 11
Referenced organisms: 4

12. Bishopp, F. C.
1950. An Expert Discusses Toxicity of Cotton Insecticides.
Agricultural Chemicals, May 1950, 4 pp.
Referenced chemicals: 2, 4, 6, 11
Referenced organisms: 4

13. Bishopp, F. C. and J. L. Horsfall
1952. Warnings as to Insecticides.
Yearbook of 1952 of the U. S. Department of Agriculture, pp. 271-275
Referenced chemicals: 6, 11
Referenced organisms: 4

14. Brown, A. W. A.
1951. Insect Control by Chemicals.
John Wiley and Sons, New York, pp. 1-817.
Referenced chemicals: 2, 4, 5, 6, 10, 11, 13, 14, 15, 16
Referenced organisms: 3, 4, 5, 6, 7, 9, 11

15. Byrd, I. B. and D. D. Moss
1952. Public Lake and Stream Investigations in Alabama. State of Alabama, Department of Conservation, Division of Game and Fish, pp. 14-15
Referenced chemicals: 2, 6, 11
Referenced organisms: 4, 11

16. Cope, O. B., Gjullin, C. M., and A. Storm
1947. Effects of Some Insecticides on Trout and Salmon in Alaska, with Reference to Blackfly Control. Transactions American Fisheries Society, vol. 77, pp. 160-177
Referenced chemicals: 2, 4, 6, 11
Referenced organisms: 4, 5, 11

17. Cottam, C. and E. Higgins
1946. DDT and Its Effect on Fish and Wildlife. Journ. Economic Entomology, vol. 39, no. 1, pp. 44-52
Referenced chemicals: 6
Referenced organisms: 4

18. Cottam, C. and E. Higgins
1946. DDT: Its Effect on Fish and Wildlife. Fish and Wildlife Service Circular, no. 11, pp. 1-14
Referenced chemicals: 6
Referenced organisms: 3, 4, 11

19. Cottam, C.
1947. Effects of DDT and Other New Insecticides on Wildlife.
Presented at symposium on "Toxicology of Insecticides to Plants and Animals Other Than Insects", American Association of Economic Entomologists, Chicago, Illinois, Dec. 26-31 (Mimeographed by U. S. Fish and Wildlife Service, pp. 1-12)
Referenced chemicals: 2, 6
Referenced organisms: 4, 6, 11

20. Cottam, C.
1948. The Effects of New Insecticides on Fish and Wildlife. Presented at meeting of American Association of Economic Entomologists, New York City, Dec. 14. (Mimeographed by U. S. Fish And Wildlife Service, pp. 1-14).
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Referenced organisms: 3, 4, 5, 11

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1954. Chemical Controls in Relation to Wildlife. Presented before Pesticide Chemicals School, Clemson Agricultural College, Clemson, S. C., Feb. 9, 1954, pp. 1-11. (Mimeographed by U. S. Fish and Wildlife Service).
Referenced chemicals: 2, 6, 8, 11, 15
Referenced organisms: 3, 4, 11

22. Couch, L. K.
1946. Effects of DDT on Wildlife in a Mississippi River Bottom Woodland.
Eleventh North American Wildlife Conference, pp. 323-329
Referenced chemicals: 6
Referenced organisms: 3, 4, 5, 7

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Journ. Economic Entomology, vol. 38, no. 2, pp. 244-249
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Referenced organisms: 4, 5

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Journ. Economic Entomology, vol. 38, no. 2, pp. 241-243
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Referenced organisms: 4

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1953. Toxicity of Some Organic Insecticides to Fish.
Sewage and Industrial Wastes, vol. 25, no. 7, pp. 840-844
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Referenced organisms: 4

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1945. Toxicity of DDT to Certain Forms of Aquatic Life.
Journ. Economic Entomology, vol. 38, no. 4, pp. 492-493
Referenced chemicals: 6
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27. Ellis, M. M., Westfall, B. A., and M. D. Ellis
1944. Toxicity of DDT to Goldfish and Frogs.
Science, vol. 100, no. 2604, p. 477.
Referenced chemicals: 6
Referenced organisms: 4

28. Everhart, W. H. and W. W. Hassler
1945. Aquarium Studies on the Toxicity of DDT to Brown Trout, Salmo trutta.
Transactions American Fisheries Society, vol. 75, pp. 59-64
Referenced chemicals: 6
Referenced organisms: 3, 4, 6

29. Ferguson, F. F., Upholt, W. M., and S. W. Simmons
1949. A Summary of the Experimental Use of DDT as a Mosquito Larvicide.
Journ. National Malarial Soc., vol. 8, no. 1, pp. 32-49
Referenced chemicals: 6
Referenced organisms: 4, 5, 8, 10

30. Ginsburg, J. M.
1945. Toxicity of DDT to Fish.
Journ. Economic Entomology, vol. 38, no. 2, pp. 274-275
Referenced chemicals: 6
Referenced organisms: 4

31. Ginsburg, J. M.
1947. Tests with Toxicants, in Comparison with DDT, on Mosquito Larvae and Fish.
Proceedings 34th Annual Meeting, New Jersey Mosquito Extermination Assoc., pp. 132-135
Referenced chemicals: 2, 4, 5, 6, 11
Referenced organisms: 4

32. Ginsburg, J. M.
1947. Results from Feeding Mosquito Larvae, Killed by DDT, to Goldfish.
Journ. Economic Entomology, vol. 40, no. 2, pp. 275-276
Referenced chemicals: 6
Referenced organisms: 4

33. Gjullin, C. M., Cope, O. B., Quisenberry, b. F., and F. R. Du Chamois
1949. The Effect of Some Insecticides on Black Fly Larvae in Alaskan Streams.
Jou-n. Economic Entomology, vol. 42, no. 1, pp. 100-105
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Referenced organisms: 4, 5

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1940. Effect of DDT on Animal Life of Bull's Island, South Carolina.
Journ. of Wildlife Management, vol. 13, no. 1, pp. 1-10
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Referenced organisms: 3, 4, 7

35. Hanson, W. R.
1952. Effects of Some Herbicides and Insecticides on Biota of North Dakota Marshes.
Journ. Wildlife Management, vol. 16, no. 3, pp. 299-308
Referenced chemicals: 4, 6, 11
Referenced organisms: 5, 7

36. Hemphill, J. E.
1954. Toxaphene as a Fish Toxin.
Progressive Fish Culturist, vol. 16, no. 1, pp. 41-42
Referenced chemicals: 11
Referenced organisms: 4, 5, 10

37. Herald, E. S.
1949. Notes on the Effect of Aircraft-distributed DDT-oil Spray upon Certain Philippine Fishes.
Journ. Wildlife Management, vol. 13, no. 3, pp. 316-317
Referenced chemicals: 6
Referenced organisms: 4

38. Hess, A. D., and G. G. Kenner, Jr.
1947. Effects of Airplane-distrubuted Aerosols on Fish and Fish Food Organisms.
Journ. Wildlife Management, vol. 11, no. 1, pp. 1-10
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Referenced organisms: 3, 4, 5, 7, 10

39. Hoffmann, C. H., and E. W. Surber
1945. Effects of an Aerial Application of Wettable DDT on Fish and Fish-food Organisms in Back Creek, West Virginia.
Transactions American Fisheries Soc., vol. 75, pp. 48-58
Referenced chemicals: 6
Referenced organisms: 4, 5, 7, 9

40. Hoffmann, C. H., and E. P. Merkel
1948. Fluctuations in Insect Populations Associated with Aerial Applications of DDT to Forests.
Journ. Economic Entomology, vol. 41, no. 3, pp. 464-473
Referenced chemicals: 6
Referenced organisms: 5, 7, 9

41. Hoffmann, C. H., and J. P. Linduska
1949. Some Considerations of the Biological Effects of DDT.
Scientific Monthly, vol. 69, no. 2, pp. 104-114
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Referenced organisms: 3, 4, 5, 7, 9, 11

42. Hoffman, C. H. and E. W. Surber
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Progressive Fish Culturist, vol. 11, no. 4, pp. 203-211
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Referenced organisms: 4, 5

43. Hoffman, C. H. and E. W. Surber
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U. S. Fish and Wildlife Service, Spec. Sci. Rept., Fisheries, no. 3, pp. 1-9
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American Midland Naturalist, vol. 50, no. 1, pp. 172-188
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45. Horsfall, W. R.
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Journ. Economic Entomology, vol. 39, no. 6, pp. 723-725
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Referenced organisms: 5

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1945. DDT Water Emulsion in Rice Fields as a Method of Controlling Larvae of Anopheles Quadrimaculatus and Other Mosquitos.
Public Health Reports, vol. 60, no. 35, pp. 1005-1009
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Referenced organisms: 4

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1950. Toxicity of Some New Insecticides to Several Species of Pond Fish.
Progressive Fish Culturist, vol. 12, no. 3, pp. 141-146
Referenced chemicals: 2, 4, 6, 10, 11
Referenced organisms: 4

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1950. Effect of Dichlorodiphenyl dichloroethane on the Clear Lake Gnat in California.
Journ. Economic Entomology, vol. 43, no. 3, pp. 328-332
Referenced chemicals: 5, 6
Referenced organisms: 4, 5, 9

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1945. Effects of DDT upon Some Aquatic Organisms, Other than Insect Larvae.
Public Health Reports, No. 7, from Supplement no. 186, pp. 3-12
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Referenced organisms: 2, 3, 4, 7, 8, 9, 10

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1949. The Effect of DDT on Freshwater Fishes.
Rept. Lands and Forests, Ontario, Canada, Division of Research Bulletin 2, "Forest Spraying and Some Effects of DDT", pp. 19-38
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Referenced organisms: 4, 5

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1949. The Effect of DDT on the Natural Fauna of the Forest Exclusive of Insect Pests.
Rept. Lands and Forests, Ontario, Canada, Division of Research Bulletin 2, "Forest Spraying and Some Effects of DDT", pp. 13-37
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Referenced organisms: 3, 4, 5

53. Lindquist, A. W., Roth, A. R., and J. R. Walker
1951. Control of the Clear Lake Gnat in California.
Journ. Economic Entomology, vol. 44, no. 4, pp. 572-577
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MASTER KEY TO REFERENCED WEEDICIDES

Organic Weedicides

1. 2-methyl-4 chlorophenoxyacetic acid
2. 2, 4-D
3. 2, 4, 5-T
4. Benoclor
5. Benoclor-3
6. Chloroben
7. Hydrocarbons (as used in references as a general term to refer to more than one such compound)
8. I P C
9. Nigrosine dyes
10. T B P
11. T C A
12. Trichlorobenzene (as used in references without referral to a trade name such as Benoclor)

Inorganic Weedicides

13. Ammate (Ammonium sulfamate)
14. Sodium arsenite

MASTER KEY TO REFERENCED ORGANISMS DESTRUCTIVELY AFFECTED BY WEEDICIDES

1. Algae (attached)
2. Crustacea
3. Fish
4. Insects
5. Invertebrates (unnamed)
6. Mollusks
7. Phytoplankton
8. Worms
9. Zooplankton
10. Miscellaneous organisms (terminology of references):
    a. Fish food organisms
    b. Bottom organisms
    c. Plankton

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NAMES OF CHEMICALS REFERRED TO IN BIBLIOGRAPHY

1. 2-methyl-4 chlorophenoxyacetic acid
2. 2, 3-dichloronapthoquinone
3. 2, 4-D (2, 4-dichlorophenoxyacetic acid)
4. 2, 4, 5-T (2, 4, 5-trichlorophenoxyacetic acid)
5. Aldrin (Compound 118; Octalene; 1, 2, 3, 4, 10, 10-hexachloro-1:4, 5:8-diendomethano-1, 4, 4a, 5, 8, 8a-hexahydronaphthalene)
6. Ammate (Ammonium sulfamate)

7. Benoclor (Chlorinated benzenes, as mono-di and trichlorobenzene)
8. Benoclor-3 (see 7)
9. B H C (Benzene hexachloride, 1, 2, 3, 4, 5, 6- hexachlorocyclohexane)
10. B H C-D D T mixture (see 9 and 18)
11. Chlordane (Technical chlordane (U. S. Dept. Agriculture) or chlordan (Amer. Chem. Soc.); Compound 1068; 1, 2, 4, 5, 6, 7, 8, 8-octachloro-4, 7-methano-3a, 4, 7, 7a-tetrahydroindane and related dicyclopentadiene derivatives; Velsicol 1068)
12. Chlorine
13. Chloroben (See 7)
14. Copper paints
15. Copper silicate
16. Copper sulfate
17. D D D (p, p)-dichlorodiphenyldichloroethane; T D E, 1, 1-bis (p-chlorophenyl)-2, 2-dichloroethane; Rothane W P-50 as a wettable powder; Rothane S-215 as an oil solution)
18. D D T (2, 2-bis (p chlorophenyl)-1, 1, 1-trichloroethane; dichlorodiphenyltrichloroethane)
19. Dehydroabietylamine acetate
20. D F D T (2, 2-bis (p fluorophenyl)-1, 1, 1-trichloroethane)
21. Dieldrin (6, 7-epoxy derivative of aldrin; compound 497; Octalox)
22. Hydrocarbons (General term of authors of various references, including such compounds cited here, as for example numbers: 9, 10, 11, 17, 18, 20, 21)
23. I P C (o-isopropyl N-phenyl carbamate)
24. Lindane (Purified preparations of B H C (see 9) which contain not less than 99% of the gamma isomer of B H C are now given the name Lindane; Gammexane)
25. Methoxychlor (Methoxy analogue of D D T, namely 2, 2-bis (p-methoxyphenyl)-1, 1, 1-tricloroethane; Marlate; Ortho-tox; Methoxyide)
26. Nigrosine Dyes (A group of black or deep blue aniline dyes obtained by oxidation of aniline and its homologues)
27. Parathion (o, o-diethyl-o-p-nitrophenyl thiophosphate; E-605)
28. Paris Green (Copper acetoarsenite; Schweinfurter green)
29. Pyrethrins
30. R A D A (Rosin Amine D Acetate)
31. Rotenone (Derris)
32. Sodium arsenite
33. T B P (Tributylphosphate)
34. T C A (Trichloroacetic acid)
35. T E P P (Tetraethyl pyrophosphate; Bladan; Pyro Phos; Baldex F-2; Vapotone; Fosvex 40 per cent T E P P; Tetron-100; Nifos T; Hexamite)
36. Toxaphene (chlorinated camphene; Compound 3956; Penacide; Gy-phene 40; Emtox 45; Toxadust; Penphene)
37. Tributylphosphate (see 35)

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